

Compound Absolute values and Double Absolute Value Inequalities

Just Watch!

$$2 \leq |x| < 5$$

$2 \leq |x|$ AND $|x| < 5$
 $|x| \geq 2$ AND $x < 5$ AND $x > -5$
 $x \geq 2$ or $x \leq -2$

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example:

$$1 \leq |x-3| \leq 4$$

$|x-3| \geq 1$ AND $|x-3| \leq 4$
 $x-3 \geq 1$ or $x-3 \leq -1$ AND $x-3 \leq 4$ AND $x-3 \geq -4$
 $x \geq 4$ or $x \leq 2$ AND $x \leq 7$ AND $x \geq -1$

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Double Absolute Value

ex: $|3x+2| < |x-2|$

① Remove one
abs. value
at a time
(start on left)

$$3x+2 < |x-2| \text{ AND } |x-2| > 3x+2$$

$3x+2 < |x-2|$ AND $|x-2| > 3x+2$
 $x-2 > 3x+2$ OR $x-2 < -3x-2$
 $-4 > 2x$ OR $4x < 0$
 $-2 > x$ OR $x < 0$
 $x < -2$

$3x+2 > -|x-2|$
 $-3x-2 < |x-2|$
 $|x-2| > -3x-2$
 $x-2 > -3x-2$ OR $x-2 < 3x+2$
 $4x > 0$ OR $-4 < 2x$
 $x > 0$ OR $-2 < x$
 $x > 2$

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④ $|2x+1| < |x+2|$

$2x+1 < |x+2|$ AND $2x+1 > -|x+2|$

$|x+2| > 2x+1$ $-2x-1 < |x+2|$

$x+2 > 2x+1$ OR $x+2 < -2x-1$ $|x+2| > -2x-1$

$1 > x$ $3x < -3$ $x < -1$ $x+2 > -2x-1$ OR $x+2 < 2x+1$

$x > -1$ $x > 1$

Number line solution: $x < -1$ or $x > 1$

Sep 17-12:23 PM